How Ambient IoT is enabling real-time carbon footprint on products.

Presented by:
Antony Yousefian – VP Climate & Circularity

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IoT Pixels turn every single thing into an agent of change.

$270M
Funding

Active Projects with
60%
of the Fortune 5

>1bln
Tags in 2024

Operationalizing sustainability with Ambient IoT

- Reduce Waste

- <mark>Real-time Carbon Footprinting</mark>

- Dynamic LCA

- Demand Chain & Circular Economy

Represented Israel at COP27 (2022)

GlOMO 23 - Best Mobile Innovation for Climate Action
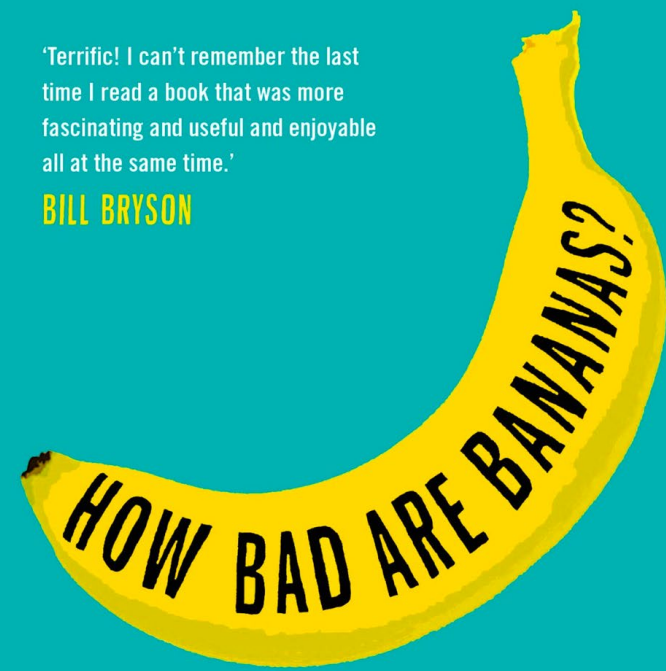
NEW EDITION – UPDATED AND EXPANDED

'Terrific! I can't remember the last time I read a book that was more fascinating and useful and enjoyable all at the same time.'
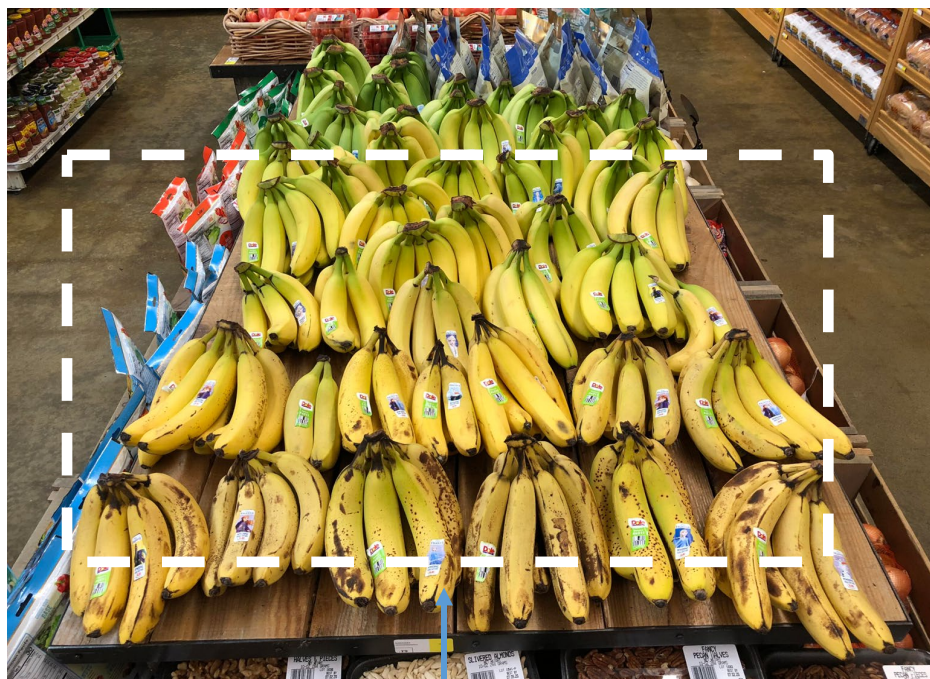
BILL BRYSON

HOW BAD ARE BANANAS?

THE CARBON FOOTPRINT
OF EVERYTHING

MIKE BERNERS-LEE

wiliot

Today c.footprints are estimates after the event

High cost & uncertainty

50g CO$_2$e

"Sourced all over the world, est carbon footprint between 5 and 95 g CO$_2$e"

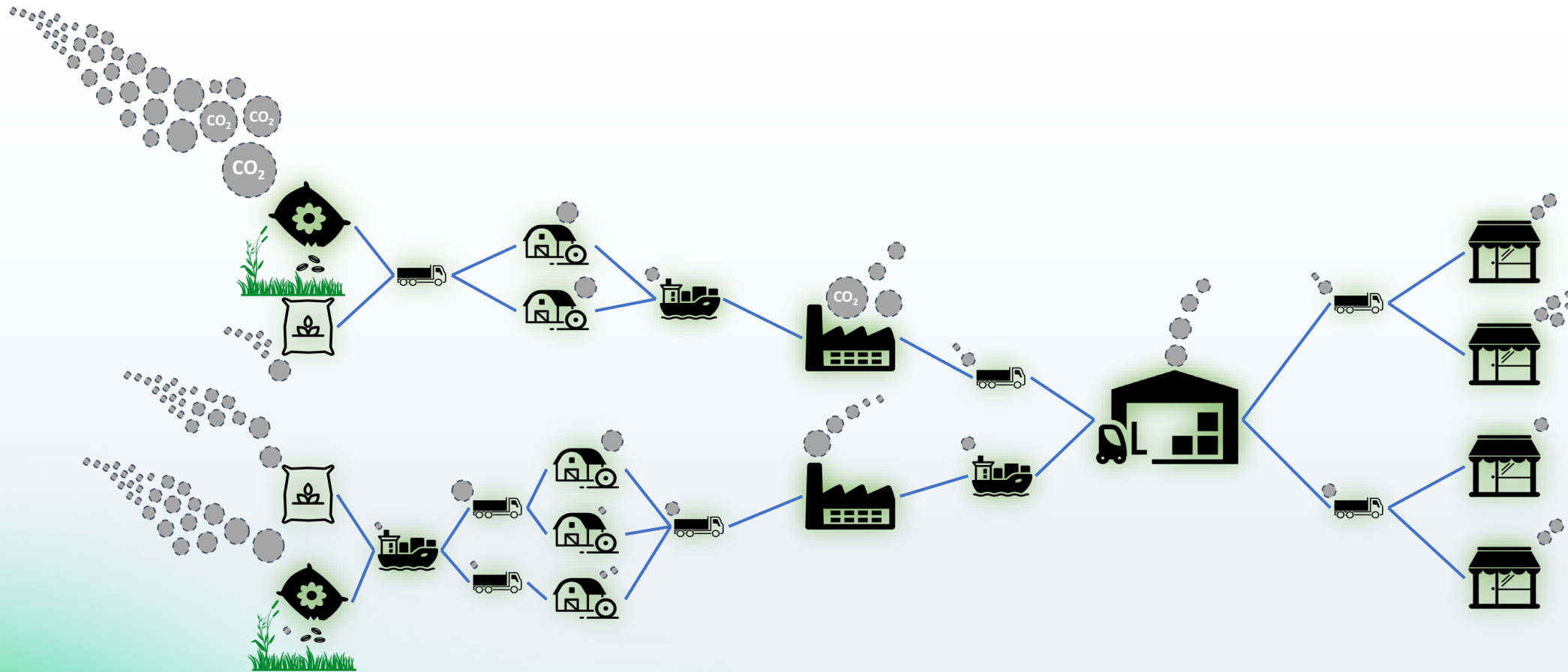## Asset level: low cost & certainty

10g CO$_2$e

"Sustainable farming practices & harvested 7 days ago. = 0 - 20g CO$_2$e each."

80g CO$_2$e

"Harvested 1 year ago, =70 - 90 g CO$_2$e each."

Today we simulate broader supply chains

High resolution carbon footprinting using existing Wiliot deployments
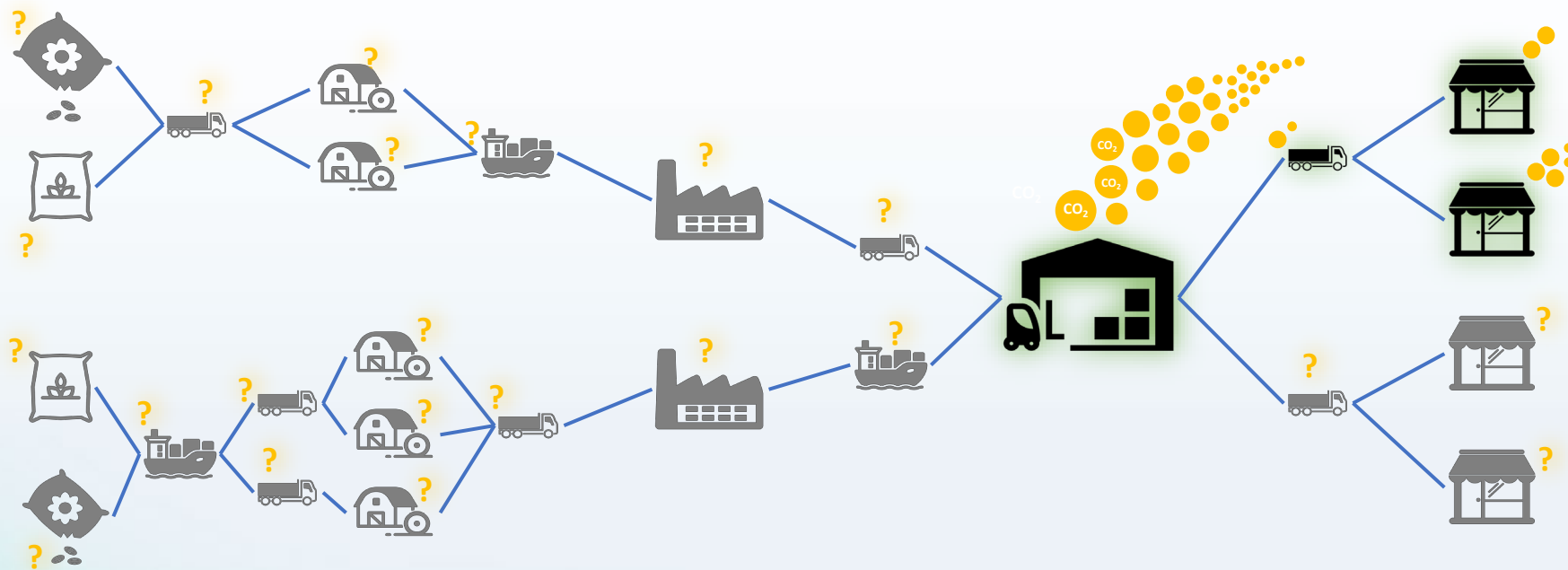
We get the key data: where, when and how long

3a. Asset moves between zones

1. Wiliot pixel events

2. Clean events, context information added

3b. Asset residence time in each zone

3c. Wiliot sensing of environmental conditions

4. Emission factors from third-parties informed by Wiliot data e.g. X kg CO_2e hour^{-1}

5. Asset-level emissions

CO_2e
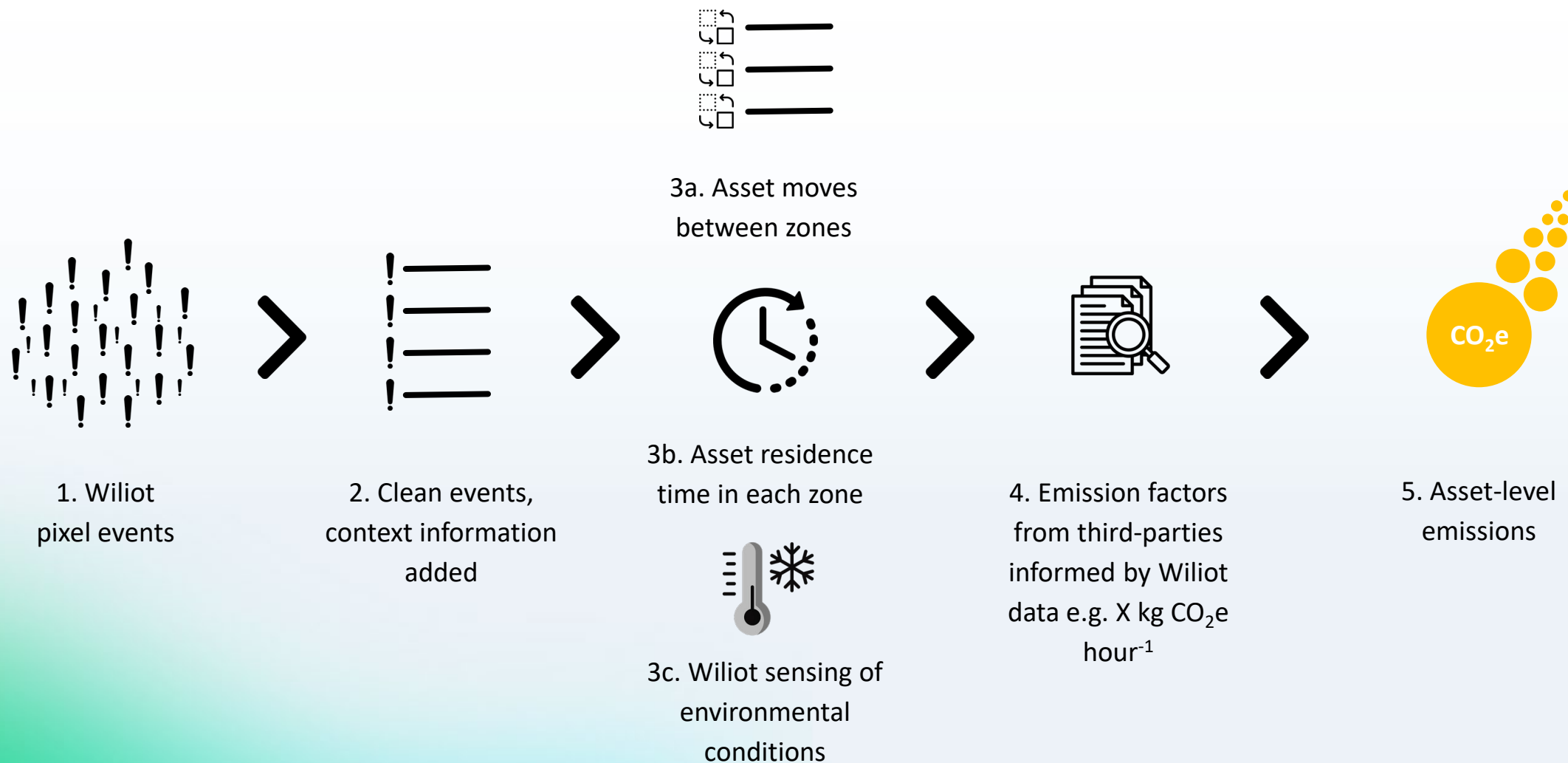
Carbon visibility real-time across supply chain
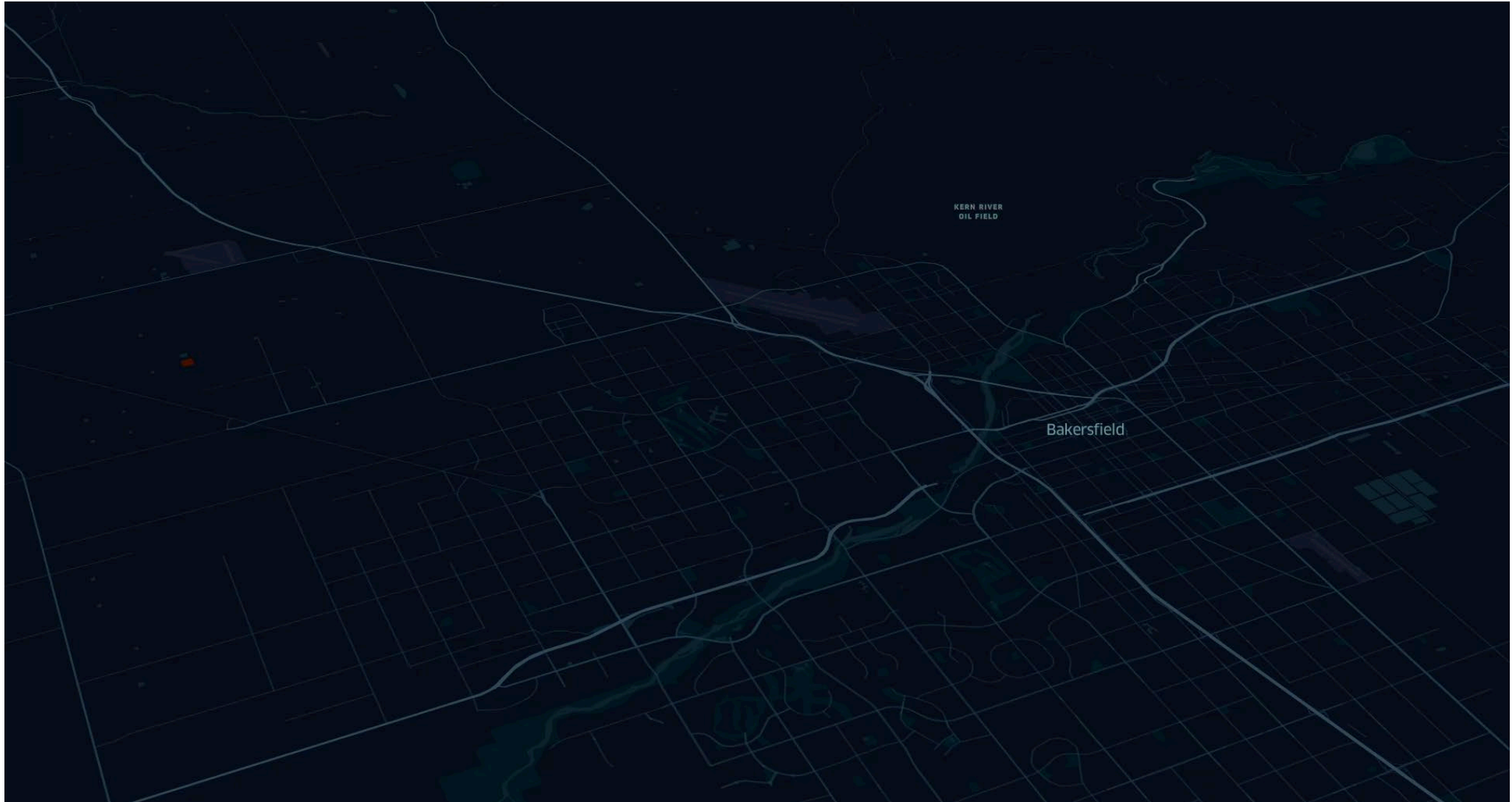
US Retailer: results overview

The average (median) carbon footprint per pallet is c. **24 kg CO$_2$e**

However, **just 20%** of pallets are responsible for **55% of total emissions.**

Just 5% highest emission pallets are responsible for **21% of total emissions.**

Number of pallets

Emissions kg CO$_2$e pallet^{-1}
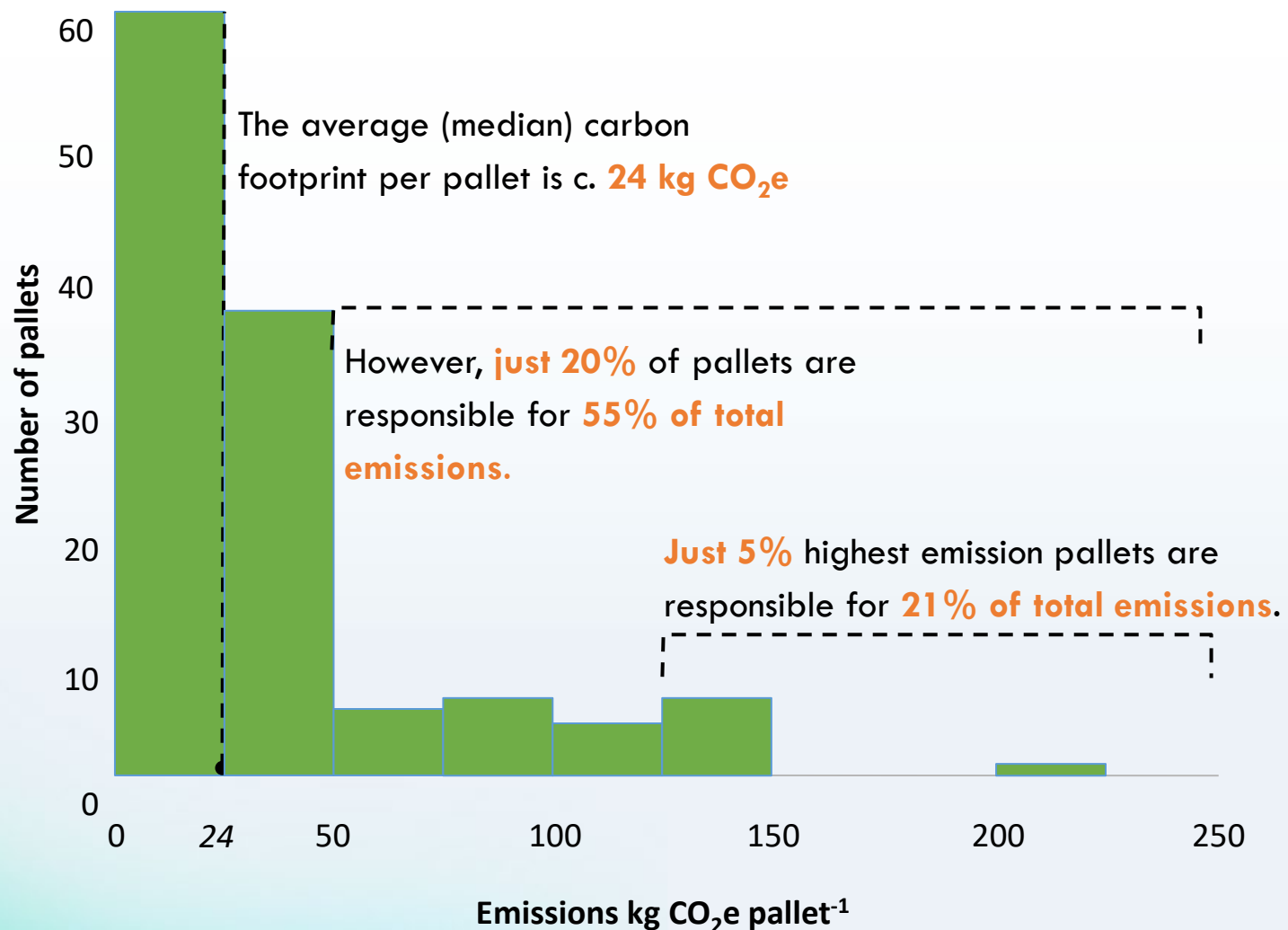
Pixels enables these unique product-level carbon insights

Increased emissions for assets in energy-intensive cold stores

Increased emissions for assets in faster moving trucks during transit and the identification of emissions due to congestion

Identification of temperature abuse which could lead to waste

Emission intensity (kg CO$_2$e hour^{-1})

*Low emission pallet - only 90 hours in the supply chain. Pallet 9114714469747: **18 kg CO$_2$e***
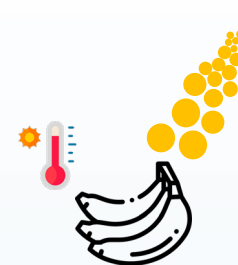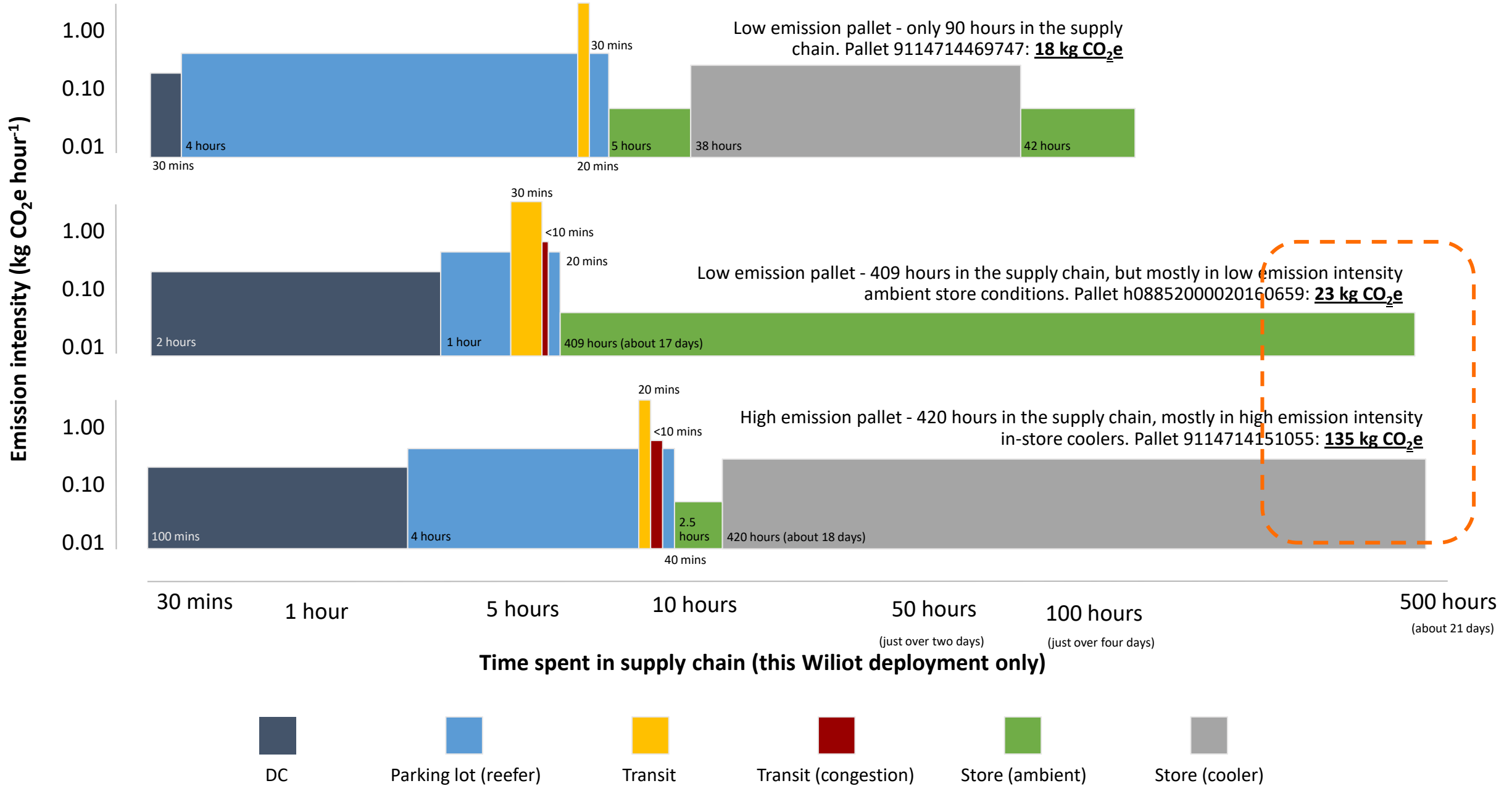
Top bar (from left): 30 mins / 4 hours / 30 mins / 20 mins / 5 hours / 38 hours / 42 hours

*Low emission pallet - 409 hours in the supply chain, but mostly in low emission intensity ambient store conditions. Pallet h08852000020160659: **23 kg CO$_2$e***

Middle bar: 2 hours / 1 hour / 30 mins / <10 mins / 20 mins / 409 hours (about 17 days)

*High emission pallet - 420 hours in the supply chain, mostly in high emission intensity in-store coolers. Pallet 9114714151055: **135 kg CO$_2$e***

Bottom bar: 100 mins / 4 hours / 20 mins / <10 mins / 40 mins / 2.5 hours / 420 hours (about 18 days)

X-axis labels: 30 mins | 1 hour | 5 hours | 10 hours | 50 hours (just over two days) | 100 hours (just over four days) | 500 hours (about 21 days)

Time spent in supply chain (this Wiliot deployment only)

Legend: DC | Parking lot (reefer) | Transit | Transit (congestion) | Store (ambient) | Store (cooler)

Perspective: we are still only looking at a fraction of total emissions

This study

| 29% | 31% | 9% | 6% | 10% | 15% |

Emissions (% of total emissions banana^{-1})

0   25   50   75   100

Farming · Transport · Packaging · DC/retail (where not included in this study) · **This study** · Disposal

Details on assumptions are presented in the Appendix
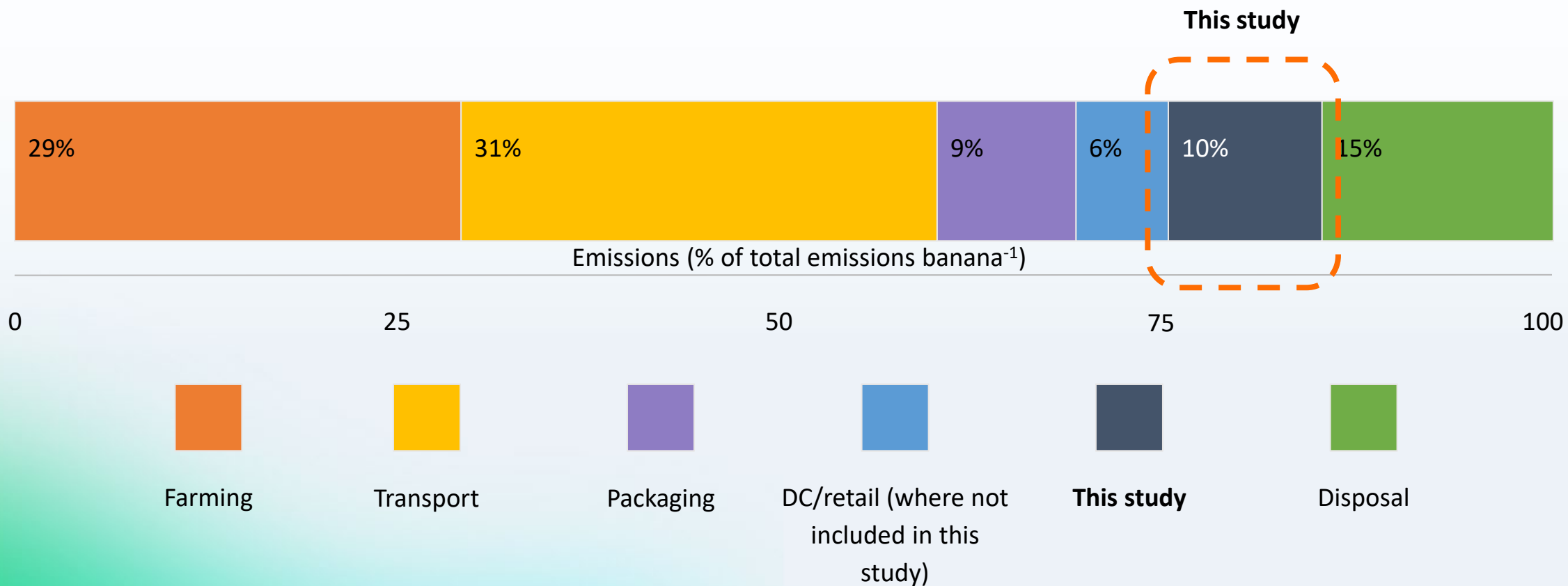
...but the potential is huge

Procuring from regenerative farmers

Improved visibility leading to fewer emissions per product.

Optimised transit & store

Improved utilisation of cold stores and management

Stock Visibility: Reduce Waste

| 29% | 31% | | 9% | 6% | 10% | 15% | Potential for significant reductions in supply chain emissions |
| 5% | 28% | | 7% | 4% | 8% | 8% | |

0   25   50   75   100

Emissions (% of total emissions banana^{-1})

Negative Emissions from Carbon sequestration (Soil)

Farming   Transport   Packaging   DC/retail   This study   Disposal

All emission reductions are high level estimates based on expert judgement at this stage.

Sourcing for planet and profit enabled

Carbon sequestration from regenerative farming

Optimum suppliers & route identified
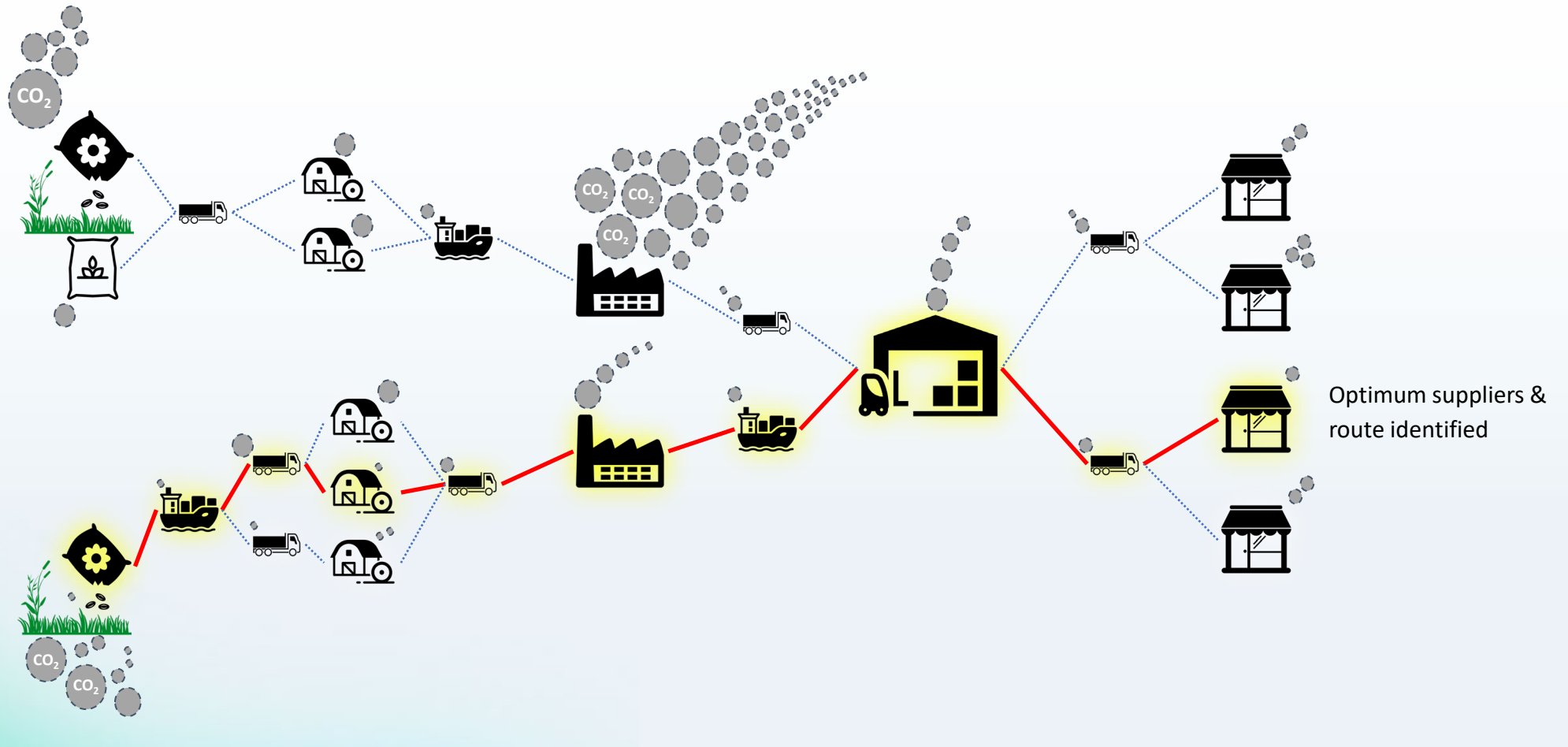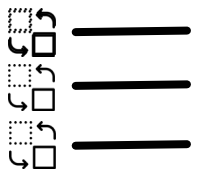
Digital Product Passport

Passport of important information for quality assessment and compliance.

Metrics become dynamic and real-time and to operationalize sustainability

When did asset movement between zones

How long it was in residence

See & validate with environmental conditions